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## **Skill Gaps and Workforce Readiness in the Industry 5.0 Era: A Bibliometric Analysis**

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### **ABSTRACT**

**Purpose:** The skill requirements for workforce preparation have changed dramatically because of Industry 5.0's shifting landscape, so there is a gap between the skills employers seek and those that job seekers possess. This study employs bibliometric analysis to explore research trends, key contributions, and emerging developments in workforce preparedness and skill gap analysis in the era of Industry 5.0, aiming to identify strategic directions for future research and development.

**Methodology:** This study examines academic papers from the Scopus and Web of Science databases using bibliometric techniques from dimension.ai websites. VOS viewer 1.6.20 is used to analyse key indicators such as co-authorship analysis and citation analysis. Major research clusters, well-known authors, top universities, and changing patterns in skill development and workforce preparedness are all identified in the study.

**Findings:** A growing research focus on talent shortages and worker preparation in Industry 5.0 is highlighted by the bibliometric study. Competency frameworks, technical skill development, and upskilling programs are important areas, although multidisciplinary collaboration and matching academic curricula to business demands continue to be difficult.

**Originality:** By providing a thorough bibliometric analysis of skill gap research, this study adds to the body of literature by highlighting important themes and suggesting future lines of inquiry to enhance worker preparedness in the industry 5.0 age.

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**Key Words:** Work readiness, skill assessment, skill gap, skill domain, employability, bibliometric analysis, Industry 5.0

## **INTRODUCTION**

Workforce readiness is becoming increasingly important as a result of the quick changes in technology and the changing nature of businesses, which have forced a change in workforce capabilities (Oswald *et. al.* 2019). Automation, artificial intelligence, and digitization are the hallmarks of Industry 4.0, which has changed the skills that employers demand (Patel and Singh, 2020). The talents that businesses require and the skills that the labour possesses, however, differ significantly. This imbalance affects productivity, employment, and economic growth, posing serious problems for economies around the world (Brown *et. al.* 2013). In this regard, bibliometric analysis is a useful tool for methodically reviewing the corpus of research on skill gaps and workforce preparedness, allowing for the discovery of patterns, seminal works, and development tactics (Wang *et. al.*, 2021).

The disparity between the abilities that businesses need and those that job seekers or employees possess is known as a "skill gap." It happens when employees don't have the skills, knowledge, or experience needed to satisfy the demands of the labour market (Cappelli, P. H. 2015). Rapid technology breakthroughs, changing industrial demands, out-of-date educational curriculum, and a lack of worker training programs are just a few of the causes of skill gaps (Wang *et. al.* 2012). The term "workforce readiness" describes how prepared people are to enter, adjust to, and function well in the labour market. In addition to having the technical skills needed for a job, a prepared workforce also has crucial soft skills, problem-solving talents, and the flexibility to adjust to changes in technology (Pandya *et. al.* 2022).

The current stage of industrial development is Industry 5.0 which emphasis on sustainable, resilient and human-centred manufacturing (S. Tyagi *et. al.* 2024). In contrast to Industry 4.0. that emphasizes digital technologies and automation, Industry 5.0. creates a collaborative work environment by fusing human intellect with innovative skills such as the robotic, artificial intelligence, and Internet of Things (IoT) (S Zeb *et. al.* 2022). By putting employee welfare and environmental responsibility first, it seeks to improve customization, efficiency, and sustainability. Industry 5.0 aims to address social and environmental issues while promoting

innovation and customized production in a future where human creativity and machine precision coexist (Martini *et. al.* 2024).

To fulfil Industry 5.0 needs and ensure employability, corporate productivity, and economic growth, skill gaps and labour readiness are crucial (Ikengam 2024). A trained workforce improves innovation, lowers unemployment, and closes the gap between university and industry. Continuous upskilling prepares people and organizations for changing technical and market challenges by fostering adaptability, career advancement, and competitiveness (Deloitte, 2022).

By analysing co-authorship networks, keyword trends, thematic developments, and citation patterns, bibliometric analysis offers an organized method for reviewing published literature on a particular topic (Klarin, A. 2024). Through the use of bibliometric tools, researchers studying skill gaps and job preparation can pinpoint gaps in the body of literature, track the development of scholarly discourse, and discover research hotspots (Aria and Cuccurullo, 2017). To close the gaps and improve employability, governments and businesses worldwide are funding upskilling programs. However, several issues still exist in spite of these efforts, including the sustainability of skill development programs, the accessibility of training programs, and the alignment of curricula with industry demands (Milan *et. al.* 2020).

The results of a bibliometric study of workforce preparedness and skill gaps have important ramifications for employment and education strategies (Wahab *et. al.* 2025). Governments should encourage vocational training and continuous learning initiatives, and educational institutions should integrate industry-relevant skills into their curricula (Meunmany, S. and Köhler, T. 2023). Additionally, companies need to take an active role in workforce development by providing internships, apprenticeships, and opportunities for on-the-job training. To guarantee a workforce prepared for the future and able to prosper in a labour market that is changing quickly, cooperation between academia, business, and politicians is crucial (Ofor-Douglas, S. and Isaiah, J. E. 2025). Addressing skill gaps is imperative for economic development and individual career growth. The current state of knowledge, new trends, and tactical methods for skill development are all revealed by a bibliometric examination of workforce preparedness research (Zupic and Cater, 2015). Stakeholders can create evidence-based policies and initiatives to improve workforce preparedness and promote long-term job

possibilities by utilizing these insights. By providing a thorough bibliometric review, this study seeks to add to the continuing conversation on skill gaps by highlighting important areas that need more research and intervention (Klarin, 2024).

## **PAST LITERATURE OF BIBLIOMETRIC ANALYSIS ON SKILL GAPS AND WORKFORCE READINESS**

The intellectual framework of studies on skill shortages and workforce preparedness has been extensively mapped using bibliometric analysis. By examining citation networks, co-authorship patterns, previous research has looked at trends, important themes, and prominent works in this field. In order to determine research trends and future directions in skill gaps and workforce preparation, this study attempts to offer a thorough bibliometric assessment. As shown in the below paragraph, this overview summarizes key findings and identifies areas for further research by providing a summary of prior studies on bibliometric analysis of skill gaps and work preparedness.

Rodríguez *et al.* (2024) conducted a global bibliometric study using VOSviewer and found significant regional disparities in skill gap research. Their findings indicate that while developed economies have received substantial attention, developing economies are often overlooked. This underscores the need for further research in underrepresented regions to enhance workforce readiness globally. Oliveira and Ferreira (2024) employed CiteSpace to examine workforce adaptability, identifying research clusters that focus on reskilling, upskilling, and lifelong learning. Their study emphasizes the growing significance of nonstop learning in a quickly growing occupation market, where those want to upgrade their skills to remain competitive. Similarly, Zhao *et. al.* (2023) conducted a bibliometric review using Bibliometrix (R package) and found a rising focus on cybersecurity, AI, and blockchain skills in workforce training. This trend reflects the increasing demand for digital competencies as industries integrate emerging technologies into their operations.

Using CiteSpace, Kumar and Das (2023) carried out a bibliometric analysis to investigate the changing needs of the workforce in Industry 5.0. Their study emphasized the increasing significance of sustainability, cognitive flexibility, and human-AI collaboration, underscoring the fact that future workforce preparedness would rely on a well-balanced blend of adaptive and technical skills. In a similar vein, Lee *et. al.* (2022) conducted a systematic literature study

using the Bibliometrix R package to investigate the growth of skills in Industry 5.0. The premise that Industry 5.0. demands more comprehensive skill set beyond solely technical capabilities was further supported by their findings, which showed an increasing demand for soft skills like emotional intelligence, creativity, and problem-solving in addition to technical expertise.

Gupta and Mehta (2022) used R-Bibliometrix to explore workforce development research and emphasized the importance of collaboration between academia, industry, and government in addressing skill shortages. Their study suggests that a multi-stakeholder approach is essential for designing effective workforce training programs. On the other hand, Hassan *et. al.* (2022) utilized VOSviewer to analyze vocational training and workforce readiness. Their research highlighted the role of government policies in improving vocational education but also identified a lack of implementation research, indicating a gap between policy development and its execution on the ground.

Wang *et. al.* (2021) conducted a bibliometric review using VOSviewer to track the evolution of skill gaps in the industry 4.0 era. Their study identified key research clusters focusing on technical skills, lifelong learning, and vocational training, demonstrating the shift toward preparing the workforce for advanced technologies. Chen *et. al.* (2020) combined bibliometric and network analysis using CiteSpace and found that research on soft skills development remains underexplored, despite its growing significance in the digital age. This aligns with the findings of Johnson *et. al.* (2019), who used Bibliometrix (R package) to analyze skill gaps and labour market trends. Their study showed a strong correlation between education policies and skill development outcomes while also identifying a gap in soft skills research, highlighting the need for a greater focus on interpersonal and cognitive skills in workforce training programs. Smith and Brown (2018) used VOSviewer to map research trends on workforce readiness. They identified a transition from general employability skills to digital and technical competencies, reflecting the growing influence of Industry 4.0 on job market demands. Their findings indicate that proficiency in digital and technical domains is becoming increasingly crucial for employability and career growth.

Overall, this body of research underscores the dynamic nature of workforce readiness and the necessity of continuous adaptation through reskilling, upskilling, and policy interventions.

While technological advancements drive demand for digital and technical skills, there remains a pressing need for more research on soft skills and implementation strategies to bridge existing gaps in workforce preparedness.

## **RESEARCH QUESTIONS**

1. What are the major trends, themes, and research gaps in the literature on workforce readiness and skill gaps?
2. How has the academic discourse on workforce readiness and skill gaps evolved over time?
3. What bibliometric tools and methodologies are commonly used in analyzing workforce readiness for Industry 5.0?

## **RESEARCH GAP**

There are still several important research gaps that need to be filled despite the expanding corpus of work on skill gaps and workforce preparedness. Existing bibliometric research, especially in developing economies where workforce difficulties are unique, mainly concentrate on general trends without providing sector-specific or regional insights. Furthermore, most of the research focuses on technical skills, whereas bibliometric analyses undervalue soft skills like communication, flexibility, and critical thinking. Additionally, there aren't many longitudinal studies that follow how workforce readiness develops over time, which makes it harder to understand how skill demands vary in response to policy and technology developments. Furthermore, despite their increasing importance in workforce development, little emphasis has been paid to the role that apprenticeships, informal learning, and vocational training play in filling skill shortages. The insufficient bibliometric evaluation of policy interventions is another significant gap that makes it challenging to measure how well industry-led and government-led initiatives are solving skill shortages. By filling in these gaps, we may expansion a more complete understanding of skill development tactics and support evidence-based workforce readiness policies for the digital age.

## **DATA SOURCES AND ANALYSIS METHOD**

Bibliometric analysis is a quantitative research approach that uses mathematical and statistical methods to assess the influence and patterns of scientific literature. To comprehend the evolution of a given topic, it entails examining citations, publications, authorship trends, and

research collaborations (Chain *et. al.* 2019). This approach aids in locating important studies, important investigators, new subjects, and research gaps. Because it offers a methodical approach to evaluating the advancement of knowledge in a field, bibliometric analysis is crucial for directing researchers in literature reviews and subsequent studies (Marzi, G. *et. al.* 2025). By emphasizing significant research patterns, it helps funding organizations, academics, and governments make decisions. It also aids in evaluating the performance of both individual and institutional research, supporting evidence-based academic and policy planning.

## DATA SOURCES

Bibliometric analysis relies on various data sources to collect and analyse research publications, citations, and academic trends. Major sources include Web of Science (WoS) and Scopus, which offer high-quality citation data, impact factors, and author metrics across multiple disciplines (Donthu *et. al.* 2021). Google Scholar is another widely used source, though its data lacks rigorous curation. Dimensions provides multidisciplinary citation and funding data. These databases help researchers track publication trends, measure research impact, and identify influential works, making them essential tools for bibliometric studies and systematic literature reviews (Linnenluecke *et. al.* 2020). In this study we collected data from dimension.ai on date 18<sup>th</sup> February 2025 using the database. We concentrated mostly on the “topic” search criterion, which includes the titles and abstracts, in order to guarantee through coverage and accuracy in our search by utilizing search terms such as “Skill Gaps” AND “Workforce Readiness” OR “Industry 5.0”. Up until Feb 18 2025, a total of 3894 papers published from 1995 to 2025 were collected, based on the type of literature as shown in the Table 2, including contributions from earlier.

**Table 1: Types of documents for publications**

| Ranking | Classification | Count | Percentage |
|---------|----------------|-------|------------|
| 1       | Article        | 2664  | 68.42%     |
| 2       | Chapter        | 543   | 13.95%     |
| 3       | Proceeding     | 370   | 9.50%      |
| 4       | Preprint       | 255   | 6.54%      |
| 5       | Manograph      | 34    | 0.87%      |
| 6       | Edited Book    | 28    | 0.72%      |

[Source: Author’s Own Compilation]

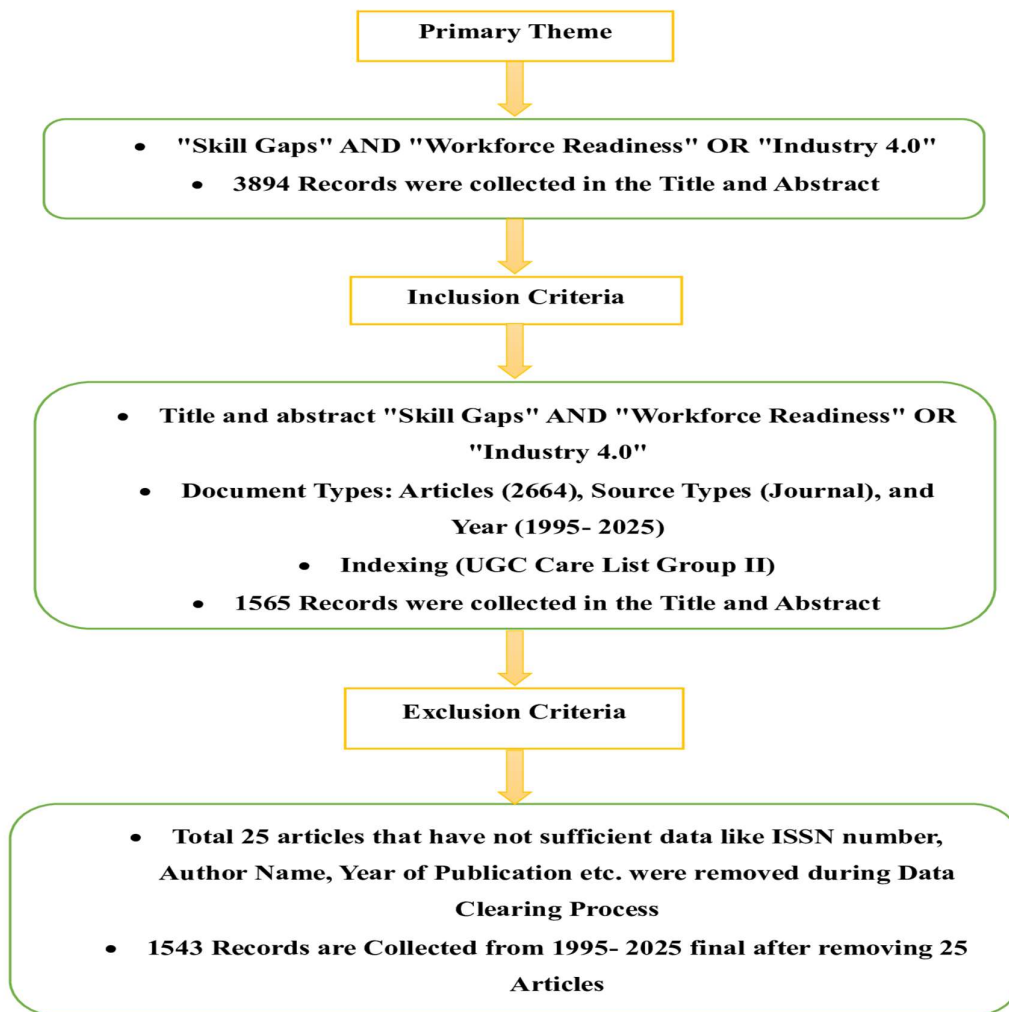
### **INCLUSION CRITERIA**

Research articles published in peer-reviewed journals in the category of UGC CARE List Group II, including the Scopus database and web science databases (Arts and Humanities Citation Index Source, Social Science Citation Index Sources and Science Citation Index Expanded Sources), during the last years, from 1995 to 2025, met the inclusion criteria for this bibliometric analysis. The topics of "Skill Gaps" AND "Workforce Readiness" OR "Industry 4.0," which are identified by pertinent keywords and phrases through preparatory literature assessments, were to be the main emphasis of the articles. To guarantee consistency in language comprehension, only English-language articles were taken into consideration. Furthermore, only articles were included. Skill gaps, workforce preparedness, or associated topics like Industry 5.0, digital transformation, and employability must be the main topics of the chosen literature. Furthermore, priority was given to research that used bibliometric techniques, systematic reviews, or empirical methods to provide important insights into workforce development.

### **EXCLUSION CRITERIA**

Several exclusion criteria were used in order to preserve the validity and applicability of this bibliometric analysis. Articles that did not fit the previously specified inclusion criteria were excluded from this bibliometric study. To keep the focus on current advancements in the discipline, articles published before 1995 or after February 18, 2025, were specifically disregarded. In order to maintain uniformity in linguistic interpretation and comprehension, non-English articles were also eliminated. In order to emphasize unique scientific contributions, papers classified as reviewers, commentaries, editorials, or meta-analyses were also disqualified. This analysis guarantees a targeted and thorough examination of excellent research pertinent to the fields of skill gap analysis and workforce readiness by using these exclusion criteria.





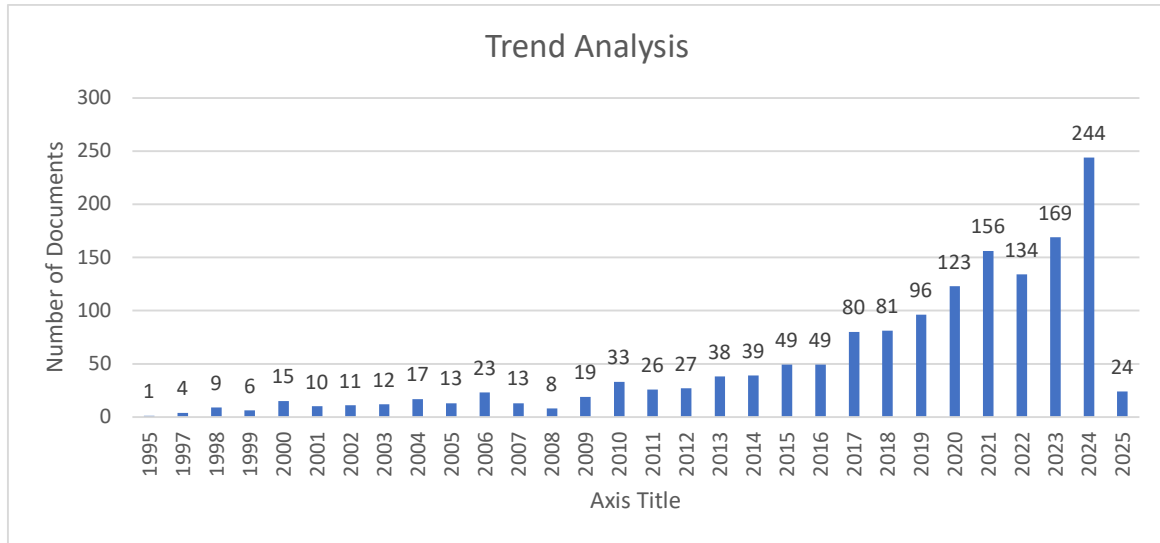
**Figure 1: Schematic for compiling publication information regarding inclusion and exclusion conditions.**

## RESULT AND DISCUSSION

### Development Trends Analysis

Research interest in skill gaps and job readiness has been steadily increasing over time, according to a bibliometric examination of papers published between 1995 and 2025. The increasing scholarly interest in workforce readiness and skill gaps in the industry 5.0. age is demonstrated by the bibliometric trend analysis. Research production was comparatively low between 1995 and 2010, with less than 50 papers per year. From 2011 on, there is a steady rise, but after 2017, there is a noticeable spike to 80 papers. Publications increased dramatically between 2018 and 2020, reaching above 100 every year, reaching a peak of 169 in 2023, and

are expected to reach 244 in 2024. This exponential rise is a reflection of the growing scholarly interest in sustainable skill development, AI-human collaboration, and workforce transformation. The increase is consistent with the requirement for flexible skill sets in Industry 5.0 and the global emphasis on digital transformation. Structured frameworks for skill integration are still developing, nevertheless, according to the statistics. According to the tendency, closing skill gaps in the workforce in the future industrial environment will require more empirical study and interdisciplinary collaboration.



**Figure 2: Development Trend Analysis** [Source: Author's Own Compilation]

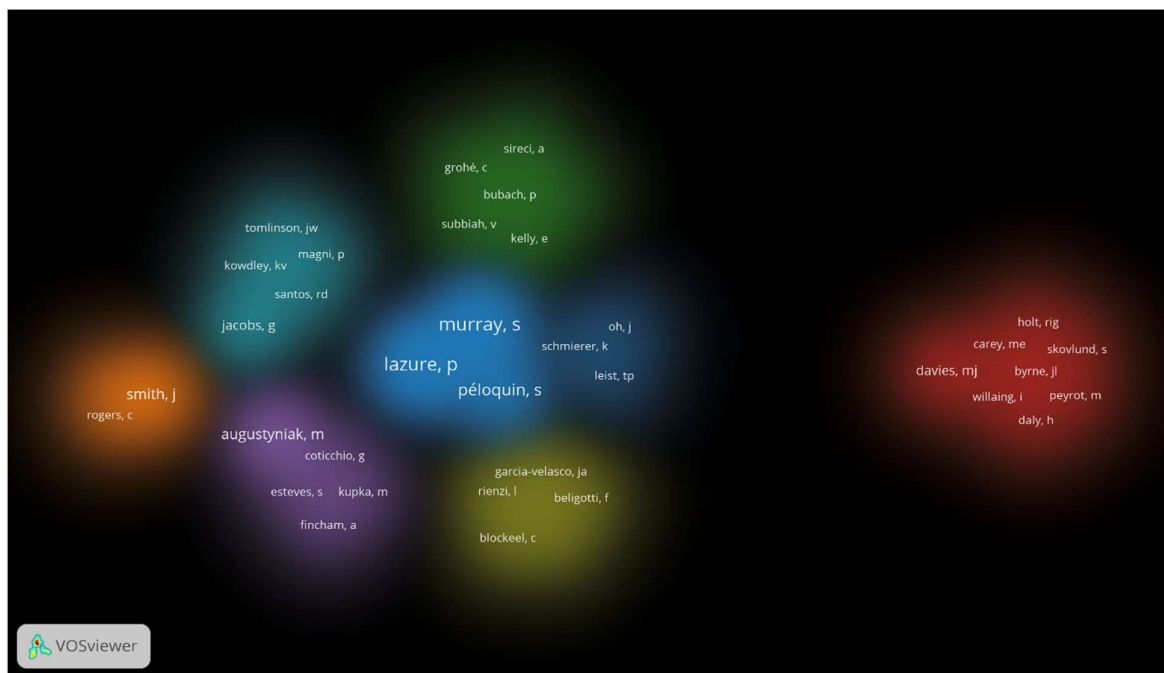
### Co-author Analysis

Co-author analysis, as employed in VOS viewer, is a bibliometric analysis technique that looks at patterns of collaboration between academics, institutions, or nations based on who co-authored academic articles (Yuan Chin Fu *et. al.* 2022). In a given topic, this study aids in identifying key writers, research networks, and trends in collaboration. Co-author analysis is shown as a network map in VOS viewer, where co-authored publications are shown by links between nodes, which stand in for authors. The frequency and level of cooperation are reflected in the links' strength (Suna, J., and Yuan, B. Z. 2020). Co-authorship analysis usually uses authors, organizations, and nations as units of analysis in VOSviewer, a software program frequently used for viewing and analysing bibliometric data. Co-authorship analysis in VOSviewer uses each of these units as follows:

- I. **Authors:** Co-authorship analysis at the author level concentrates on individual researchers who work together on scholarly papers. Within a particular subject, this study aids in mapping research networks, identifying key scholars, and assessing

collaboration trends (Fonseca *et. al.* 2016). Researchers may observe who commonly collaborates and the structure of research communities by visualizing co-authorship links. Strong ties between writers suggest regular cooperation, which results in the development of specialized knowledge groups (Bordobs *et. al.* 2015). Institutions seeking to identify important contributors in a field of study and early-career scholars seeking possible collaborators may find this analysis especially helpful.

In this analysis, 4588 authors are found by ignoring documents with 25 maximum number of authors per document and only 3506 authors meet the threshold with 1 minimum number of document and 1 citation by author. Out of authors, 22 authors have the largest set of connected items, as shown in figure 3.



**Figure 3: The bibliometric chart formed based on co-authorship with density visualization mode based on author as a unit of analysis [Source: Author's own]**

The provided data in Table 2 presents a ranking of the top 10 authors based on their publication, Citations, and average citations per article. Our bibliometric study's co-author analysis reveals notable variations in top writers' output and scholarly influence. Jackson and Denise are the most influential, with seven articles and 500 citations, or an impressive average of 71.43 citations per article. In contrast, Murray and Suzanne's six publications average 6.33 citations, whereas Lazure and Patrice's seven articles only average 5.43. Carlisle and Sheena demonstrate a notable impact with an average of 39 citations across 4 articles, while Ivanov and Stanislav

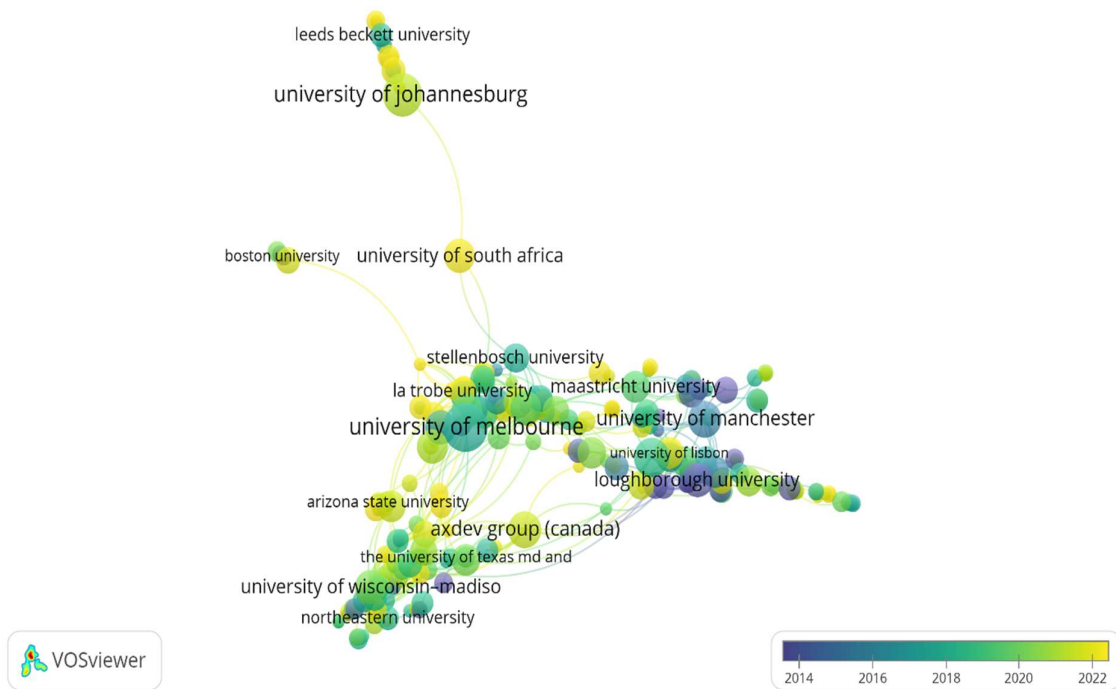
also stand out with an average of 40.33 citations over 3 publications. The moderate to low averages of other writers reflects differences in research influence and the diverse contributions that uniquely shape this emerging field.

**Table 2: Top 10 Authors Publications, Citations, and Average Citations**

| Rank | Author               | Publications | Citations | Average Citations Per Article |
|------|----------------------|--------------|-----------|-------------------------------|
| 1.   | Jackson and Denise   | 7            | 500       | 71.43                         |
| 2.   | Lazure and Patrice   | 7            | 38        | 5.43                          |
| 3.   | Murray and Suzanne   | 6            | 38        | 6.33                          |
| 4.   | Pillay and Rubin     | 5            | 86        | 17.2                          |
| 5.   | Vass and Vimos       | 5            | 11        | 2.2                           |
| 6.   | Carlisle and Sheena  | 4            | 156       | 39                            |
| 7.   | Peloquin and Sophie  | 4            | 29        | 7.25                          |
| 8.   | Futcher and Lynn     | 3            | 2         | 0.66                          |
| 9.   | Heisig and Jan Paul  | 3            | 85        | 28.3                          |
| 10.  | Ivanov and Stanislav | 3            | 121       | 40.33                         |

[Source: Author's Own Compilation]

- II. **Organization:** Co-authorship analysis looks at university, research centre, and company R&D department collaboration at the organizational level. This analysis aids in benchmarking the impact of institutional research, evaluating institutional partnerships, and comprehending university-industry or inter-university collaborations (Danquah *et. al.* 2024). Policymakers and funding organizations can find research centers and strategic partnerships that support scientific breakthroughs by visualizing institutional networks. In this analysis, 1804 organisations are found by ignoring documents with 25 maximum number of organization per document. Only 379 organizations meet the threshold with minimum numeral of documents and citations by author is 2. Out of 379 organization, 270 organisations have the largest set of linked items, as shown in Figure 2.



**Figure 4: The bibliometric plot shaped based on co-authorship with overlay visualisation method based on Organisations as unit of analysis [Source: Author's Own]**

The data in Table 4 related to the bibliometric information on the institutional contributions to workforce preparation and skill gap research, identifies important universities influencing the scholarly conversation. With 17 publications, 502 citations, and an average of 29.52 citations per article, the University of Melbourne is in first place. With just two publications, York University distinguishes out thanks to its remarkable average of 187.5. With nine articles each, Loughborough University and the University of Queensland have respective averages of 33 and 26.88 citations. With four outputs, Swinburne University of Technology averages 66 citations. With moderate averages ranging from 32 to 49.80, Rutgers, the University of Sheffield, the University of Glasgow, and RMIT University all maintain balanced profiles. At 17.92, the University of Johannesburg has the lowest average despite 13 publications. These patterns highlight significant variations in the influence of institutional research in this dynamic and ever-evolving subject.

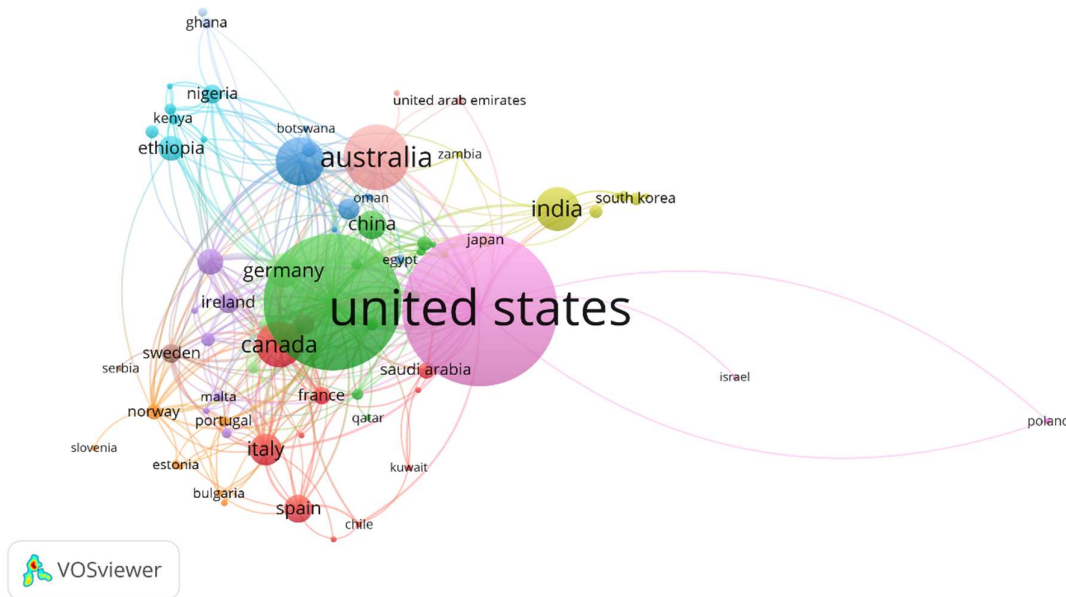
**Table 3: Top 10 Organization Publications, Citations, and Average Citation per Articles**

| Rank | Organisations                               | Publication | Citations | Average citation per article |
|------|---------------------------------------------|-------------|-----------|------------------------------|
| 1    | University of Melbourne                     | 17          | 502       | 29.52                        |
| 2    | York University                             | 2           | 375       | 187.5                        |
| 3    | Loughborough University                     | 9           | 297       | 33                           |
| 4    | Swinburne University of Technology          | 4           | 264       | 66                           |
| 5    | Rutgers, The State University of New Jersey | 5           | 249       | 49.80                        |
| 6    | University of Sheffield                     | 6           | 248       | 41.33                        |
| 7    | University of Queensland                    | 9           | 242       | 26.88                        |
| 8    | University of Johannesburg                  | 13          | 233       | 17.92                        |
| 9    | University of Glasgow                       | 6           | 231       | 38.50                        |
| 10   | RMIT University                             | 7           | 227       | 32.43                        |

[Source: Author's Own Compilation]

III. **Country:** Co-authorship analysis examines international research collaboration at the national level by detecting collaborations among various nations. This analysis demonstrates how countries contribute to the creation and sharing of information, highlighting international collaboration in scientific research (Munoz *et. al.* 2016). Additionally, it identifies international and regional research clusters, including partnerships between developed and developing countries or inside the European Union.

In this analysis, 93 countries are found by ignoring documents with 25 maximum number of countries per documents. Only 78 countries meet the threshold with minimum number of documents and citations by author is 2. Out of 78 countries, 75 countries have the largest set of linked items, as show in figure 5, the bibliometric map formed created on co-authorship through network visualisation method based on Organizations as unit of analysis.



**Figure 5: The bibliometric plot shaped based on co-authorship with network visualisation method based on counties as unit of analysis [Source: Author's Own]**

The national review of Industry 5.0 workforce research shows notable contributions and regionally varied impacts. The United Kingdom comes in second with 267 publications and 4503 citations, averaging 16.87 citations per piece, while the United States leads with 313 publications and 4609 citations, averaging 14.73 citations per article. Canada has 62 articles with an average of 18.47 citations, whereas Australia has a great influence with an average of 20.35 citations from 99 publications. With less average citations, South Africa, India, Germany, and Italy all have moderate outputs. The existence of a few extremely significant research studies is seen in Norway, which notably obtains an outstanding average of 39.43 citations despite only having 14 publications. When it comes to filling talent shortages in Industry 5.0, this discrepancy amply demonstrates regional strengths and prospects for improved cooperation.

**Table 4: Top 10 Countries Publications, Citations, and average Citation per Articles**

| Rank | Country        | Publication | Citations | Average citation per articles |
|------|----------------|-------------|-----------|-------------------------------|
| 1    | United States  | 313         | 4609      | 14.73                         |
| 2    | United Kingdom | 267         | 4503      | 16.87                         |
| 3    | Australia      | 99          | 2015      | 20.35                         |

|    |              |    |      |       |
|----|--------------|----|------|-------|
| 4  | Canada       | 62 | 1145 | 18.47 |
| 5  | South Africa | 66 | 869  | 13.16 |
| 6  | China        | 33 | 680  | 20.60 |
| 7  | India        | 58 | 656  | 11.31 |
| 8  | Germany      | 41 | 596  | 14.54 |
| 9  | Italy        | 38 | 553  | 14.55 |
| 10 | Norway       | 14 | 552  | 39.43 |

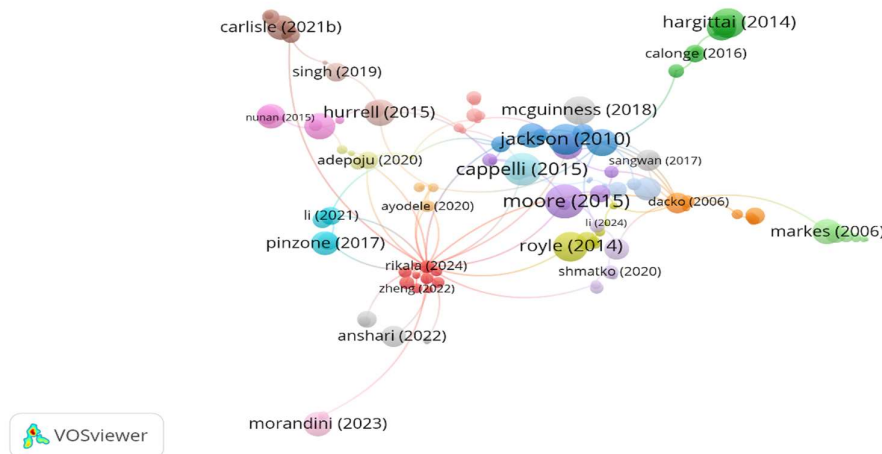
[Source: Author Own Compilation]

### Citation Analysis

Citation analysis can be performed in VOSviewer to investigate the effect and impact of documents, authors, organizations, nations, and sources (journals) in bibliometric research.

**Document:** Document-level citation analysis focuses on individual research articles and the number of citations they contain. The citation linkages between the most well-known works on a subject are mapped using this method (Boyack *et. al.* 2010). After importing bibliometric data from sources like Web of Science or Scopus, researchers can create a citation map in VOSviewer by selecting "Documents" as the unit of analysis and setting a minimum citation threshold. The final representation displays documents as nodes, with larger nodes signifying highly cited papers and links suggesting citation relationships between them. The emerging clusters reflect thematic groups of related topics. Finding fundamental articles, understanding how knowledge has changed over time, and monitoring the development of research are all made easier with the help of document citation analysis. In this analysis, 1543 documents are found. Only 1117 documents meet the threshold with minimum quantity of citations of a document is 1. Out of documents, 130 documents have the largest set of linked items as shown in Figure 6.





**Figure 6: The bibliometric chart shaped based on co-citation a network visualisation method based on documents a unit of analysis [Source: Author's Own]**

The influence of important papers influencing research on skill shortages and workforce preparedness in Industry 5.0 is revealed by an analysis of citation data. With the most citations (368), Seitanidi *et al.* (2008) made a significant contribution that influenced further research. With 248 and 232 citations, respectively, Moore *et al.* (2015) and Cappelli *et al.* (2015) provides insights that academics found compelling. With 183–194 citations each, Jackson *et al.* (2010), Foss *et al.* (2018), and Dutta *et al.* (2020) continues to have an impact. The discussion is further enhanced by the writings of Cox *et al.* (2013), Royle *et al.* (2014), Hargittai *et al.* (2014), and McGuinness *et al.* (2018). All things considered, the varied citation numbers demonstrate how this field's research is dynamic and diversified.

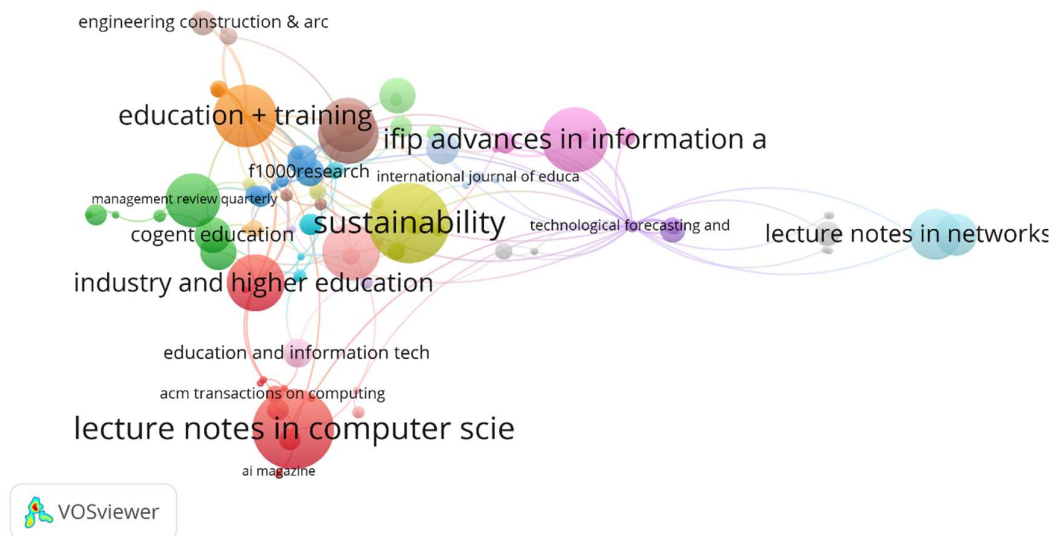
**Table 5: Top 10 Documents citation**

| Rank | Documents                      | Citations |
|------|--------------------------------|-----------|
| 1    | Seitanidi <i>et al.</i> (2008) | 368       |
| 2    | Moore <i>et al.</i> (2015)     | 248       |
| 3    | Cappelli <i>et al.</i> (2015)  | 232       |
| 4    | Jackson <i>et al.</i> (2010)   | 194       |
| 5    | Foss <i>et al.</i> (2018)      | 191       |
| 6    | Dutta <i>et al.</i> (2020)     | 183       |
| 7    | Cox <i>et al.</i> (2013)       | 181       |
| 8    | Royle <i>et al.</i> (2014)     | 178       |

|    |                                  |     |
|----|----------------------------------|-----|
| 9  | Hargittai <i>et. al.</i> (2014)  | 174 |
| 10 | Mcguinness <i>et. al.</i> (2018) | 155 |

[Source: Author's Own Compilation]

**Sources:** Journal-level citation analysis looks at the frequency of citations to various sources (academic journals). This method aids in locating high-impact journals in a certain field of study and comprehending their impact (Wakeling *et. al.* 2016). By choosing "Sources" as the unit of analysis in VOSviewer, researchers can examine journal citation trends. Journals are shown as nodes in the graphic, with linkages showing the citation relationships between journals and larger nodes signifying highly cited sources. When choosing which journals to publish in, evaluating the impact of journals, and comprehending patterns of academic communication, researchers and institutions can benefit from this analysis. In this analysis, 928 sources are found. Only 732 sources meet the threshold with minimum number of documents and citations of a sources is 1. Out of the sources, 115 sources have the largest set of linked items, as shown in Figure 7.



**Figure 7: The bibliometric chart designed based on co-citation with network visualization style based on sources a unit of analysis [Source: Author's Own]**

Research on skill shortages and workforce readiness in Industry 5.0 has been impacted in different ways, according to an analysis of important sources in the subject. With 17 publications and 395 citations, "Education + Training" is in first place. Its strong performance

is backed by a 7.2 CiteScore and Q1 ranking. With 4 publications and 372 citations, "Information Communication & Society" comes next, enjoying a great impact factor and a high CiteScore of 10.2. With steady Q1 rankings and strong metrics, "Sustainability" and "Studies in Higher Education" continue to have competitive profiles. A notable example of specialized influence is the 368 citations that "Journal of Business Ethics" receives from a single publication. Overall, these sources highlight multidisciplinary approaches and specialized research influence in solving Industry 5.0 workforce concerns at scale, reflecting a variety of contributions and rigorous scholarly standards.

**Table 6: Topmost productive sources with the most cited articles**

| Rank | Sources                                   | Publication | Citations | Citescores 2023 | Quartile | Impact Factor 2023 | Publisher                       | SNIP  | SJR   | h-Index |
|------|-------------------------------------------|-------------|-----------|-----------------|----------|--------------------|---------------------------------|-------|-------|---------|
| 1    | Education + Training                      | 17          | 395       | 7.2             | Q1       | 3.2                | Emerald Publishing              | 1.485 | 0.761 | 85      |
| 2    | Information Communication & Society       | 4           | 372       | 10.2            | Q1       | 4.2                | Taylor & Francis Ltd.           | 2.528 | 1.916 | 114     |
| 3    | Journal Of Business Ethics                | 1           | 368       | 1.00            | Q2       | 4.8                | Philosophy Documentation Centre | 0.475 | 0.22  | 4       |
| 4    | Sustainability                            | 24          | 360       | 6.8             | Q1       | 3.3                | MDPI                            | 1.086 | 0.672 | 169     |
| 5    | Industry and Higher Education             | 15          | 343       | 4.2             | Q2       | 3.5                | SAGE Publications Ltd           | 1.113 | 0.526 | 32      |
| 6    | Studies in Higher Education               | 4           | 303       | 10.2            | Q1       | 3.7                | Routledge                       | 2.628 | 1.614 | 129     |
| 7    | European Journal of Engineering Education | 3           | 290       | 7.3             | Q2       | 2.3                | Taylor & Francis Ltd.           | 2.213 | 0.773 | 59      |
| 8    | Ilr Review                                | 3           | 235       | 6.8             | Q1       | 2.9                | SAGE Publications Ltd.          | 2.175 | 2.022 | 91      |
| 9    | Journal Of Education and Work             | 6           | 226       | 2.7             | Q2       | 1.5                | Brill Academic Publishers       | 0.940 | 0.467 | 45      |
| 10   | Human Resources for Health                | 3           | 215       | 8.1             | Q1       | 3.9                | BioMed Central Ltd.             | 2.076 | 1.577 | 79      |

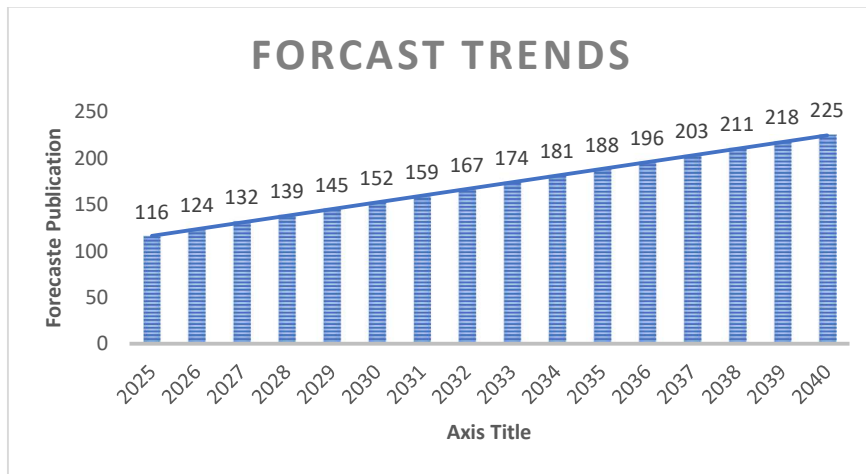
[Source: Author's Own Compilation]

### Forecast Trend analysis

The bibliometric data on "Skill Gaps and Workforce Readiness in the Industry 5.0. Era" shows a consistent rise in scholarly publications between 2025 and 2040, according to the predicted trend analysis. The anticipated numbers increase steadily, reaching 225 publications by 2040 from 116 in 2025. This expansion indicates a growing interest in filling skill gaps in the

changing Industry 5.0 landscape from both academia and industry. The growing tendency emphasizes how urgently research on automation, human-AI collaboration, workforce preparation, and new skill requirements is needed. In order to ensure employability and competitiveness in an advanced technology era, policymakers, educators, and business leaders must proactively respond to these insights by coordinating training programs and curricula with future workforce needs.

**Table 7: Topmost Productive sources with the Most cited articles**



## CONCLUSION

The significant difficulties presented by Industry 5.0 and the changing labour market are highlighted by this bibliometric study of skill gaps and workforce preparedness. Productivity, employment, and economic growth are all impacted by the findings, which show a continuing disparity between the skills that companies require and those that the workforce possesses. This study finds important research trends, significant writers, and theme advancements in workforce preparedness and skill development initiatives by conducting a thorough analysis of academic publications.

The study emphasizes the value of reskilling and upskilling programs and the part that industry stakeholders, legislators, and educational institutions play in closing these gaps. According to emerging themes, problem-solving abilities, flexibility, and digital literacy are becoming more and more crucial in today's job. Additionally, developing focused training programs that meet changing job market demands requires cooperation between academia and industry.

Longitudinal studies evaluating the effectiveness of current workforce growth initiatives and the influence of technology developments on skill requirements have to be the main focus of future study. Policymakers and educators may create strategic interventions that improve workforce readiness and guarantee a more resilient and competitive labour market by utilizing data-driven insights. In the digital age, successfully filling skill gaps will boost employability and promote long-term economic growth.

### **LIMITATION**

Bibliometric analysis provides valuable insights into workforce preparedness and skill gaps but has notable limitations. First, relying on databases like Scopus and Web of Science may exclude relevant studies from regional journals and industry reports, leading to underrepresentation of perspectives from developing economies. Second, its focus on quantitative metrics such as citation counts and keyword co-occurrence often overlooks qualitative aspects like sociocultural factors and policy effectiveness. Third, the rapid evolution of Industry 5.0 necessitates regular updates to maintain relevance. To address these issues, future research should integrate bibliometric data with qualitative methods like case studies and expert interviews for a comprehensive understanding.

### **FUTURE SCOPE OF STUDY**

A more thorough approach should be taken in future studies on skill shortages and workforce preparedness by combining bibliometric analysis with qualitative techniques, including policy evaluations, expert interviews, and case studies. Deeper understanding of the industry-specific and contextual issues influencing worker readiness would result from this. To evaluate the long-term effects of skill development programs on employability, career advancement, and economic productivity, longitudinal studies can also be carried out.

Given the speed at which Industry 5.0 technologies are developing, future research should examine how automation, machine learning, and artificial intelligence are influencing labour demands. Policymakers and educators can create focused skilling programs by looking into how digital transformation affects skill requirements across various sectors. A more inclusive understanding of skill gaps can be ensured by addressing current gaps in global representation by extending bibliometric analysis to incorporate regional and industry-specific research.

To create long-term workforce development plans, cooperation between government, business, and academics should also be investigated. Predictive analytics and real-time labour market data should be used in future studies to provide flexible approaches to closing skill gaps. Future research can help create adaptive skilling frameworks that improve workforce preparedness in a changing labour market by integrating interdisciplinary viewpoints.

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